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(54) SEPARATOR FOR ALKALINE BATTERY AND MANUFACTURE THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a separator for an alkaline battery having excellent hydrophilic property, liquid-retainability, and high alkali resistance and to provide a manufacturing method for the separator.

SOLUTION: This separator is obtained by carrying out wet paper making process of polyolefin type synthesized pulp containing 1.0-10.0wt.% of polyvinyl alcohol after heating treatment at not lower than 100° C and not higher than the melting point of the synthesized pulp in dry condition or by carrying out wet paper making of the synthesized pulp after heating treatment and mixing a polyolefin type thermally melting fibrous binder, drying, and carrying out a thermally melting and depositing process at not higher than the melting point of the synthesized pulp and not lower than the melting point of the polyolefin type thermally melting fibrous binder.

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CLAIMS

[Claim(s)]
[Claim 1] The separator for alkaline cells with which it is characterized by being obtained by carrying out wet paper making after a polyvinyl alcohol content heat-treats 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp in dryness at the temperature below 100 degrees C or more and the melting point of said synthetic pulp.
[Claim 2] A polyvinyl alcohol content 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp In dryness, wet paper making of the polyolefine system heat welding fiber binder 5 thru/or the 60 % of the weight is mixed and carried out to the thing 40 heat-treated at the temperature below 100 degrees C or more and the melting point of said synthetic pulp thru/or 95% of the weight. After desiccation, The separator for alkaline cells characterized by being obtained by ****(ing) at the temperature below the melting point of said synthetic pulp, and beyond the welding temperature of said polyolefine system heat welding fiber binder.
[Claim 3] The separator for alkaline cells given in claim 1 or the 2nd term by which said synthetic pulp carries out flash plate spinning of the emulsion, and is produced.
[Claim 4] The separator for alkaline cells given in any 1 term of 3 in which a surfactant exists on the preceding paragraph story or latter-part story of said heat treatment and which is not claim 1.
[Claim 5] The separator for alkaline cells given in claim 1 whose specific surface area of said polyolefine synthetic pulp is more than 0.1m2 / g thru/or any 1 term of 4.
[Claim 6] The separator for alkaline cells given in claim 1 said whose polyolefine synthetic pulp is a polyethylene synthetic pulp thru/or any 1 term of 5.
[Claim 7] The process of the separator for alkaline cells which carries out wet paper making of the polyolefine synthetic pulp which is the process of said separator for alkaline cells according to claim 1, and was heat-treated at the temperature below 100 degrees C or more and the melting point in dryness, and is characterized by drying by hot blast 100 degrees C or less.
[Claim 8] The process of the separator for alkaline cells which mixes and carries out wet paper making of the polyolefine system heat welding fiber binder 5 thru/or the 60 % of the weight to the heat-treated polyolefine system synthetic pulp 40 thru/or 95% of the weight according to claim 7, and is characterized by heat-treating at the temperature below the melting point of a synthetic pulp beyond the welding temperature of said polyolefine system heat welding fiber binder after desiccation.
[Claim 9] The process of the separator for alkaline cells according to claim 8 processed with 80 thru/or 100-degree C hot water after heat-treating at the temperature below the melting point of said synthetic pulp, and beyond the welding temperature of said polyolefine system heat welding fiber binder.
[Claim 10] The process of the separator for alkaline cells according to claim 7 or 8 with which a surfactant exists on the preceding paragraph story or latter-part story of said heat treatment.
[Claim 11] The process of the separator for alkaline cells given in claim 7 whose specific surface area of said polyolefine is more than 0.1m2 / g thru/or any 1 term of 10.
[Claim 12] The process of the separator for alkaline cells given in claim 7 said whose polyolefine synthetic pulp is a polyethylene synthetic pulp thru/or any 1 term of 11.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the separator for alkaline cells which was excellent in the hydrophilic property made from the specific synthetic pulp in more detail, and its process about the separator used for alkaline cells, such as a nickel-cadmium battery and a nickel hydoride battery, and its process.
[0002]
[Description of the Prior Art] The nonwoven fabric of the polyamide fiber excellent in the hydrophilic property and the nonwoven fabric of polyolefine fiber excellent in alkali resistance are conventionally used for the separator for alkaline cells. However, by using it repeatedly, it decomposes in the alkali electrolytic solution, and a polyamide fiber generates nitrogen oxides, and has the fault referred to as contracting a battery life. Moreover, although, as for polyolefine fiber, hydrophilic processing is made by the surfactant since it is hydrophobicity originally, it deteriorates gradually in the electrolytic solution, the engine performance is lost, and a surfactant has the fault referred to as that a hydrophilic property is lost soon.
[0003] Moreover, the nonwoven fabric of sulfonation polyolefine fiber excellent in the hydrophilic property which improved the fault of polyolefine fiber has also come to be used for recent years.
[0004]
[Problem(s) to be Solved by the Invention] However, concentrated sulfuric acid or an oleum is used for the aforementioned sulfonation polyolefine fiber in process of sulfonation, and since the yield is bad, it is the high thing of cost.
[0005] this invention person develops the separator for alkaline cells excellent in a hydrophilic property, solution retention, and endurance, and is doing patent application as Japanese Patent Application No. No. 329259 [seven to] while he can manufacture cheaply by recognizing the trouble of this conventional technique, repeating research for the purpose of the amelioration, and being made from a specific synthetic pulp.
[0006] By retesting said invention and using other different materials from the above-mentioned invention as a synthetic pulp of the above-mentioned material in the process which continues research further, this invention person did the knowledge of the separator for alkaline cells which has the property which was excellent like the above-mentioned invention being obtained, did based on this knowledge, and completed this invention.
[0007]
[Objects of the Invention] Then, the purpose of this invention can be manufactured cheaply and is to offer the separator for alkaline cells excellent in a hydrophilic property, solution retention, and endurance, and its process.
[0008]
[Means for Achieving the Goal] This invention is proposed in order to attain said purpose, and it has the description at the point using the polyolefine synthetic pulp after performing specific processing as a material.
[0009] That is, according to this invention, the separator for alkaline cells with which a polyvinyl alcohol content is characterized by being obtained by carrying out wet paper making after heat-treating 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp in dryness at the temperature below 100 degrees C or more and the melting point of said synthetic pulp is offered.
[0010] According to this invention, a polyvinyl alcohol content moreover, 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp In dryness, wet paper making of the polyolefine system heat welding fiber binder 5 thru/or the 60 % of the weight is mixed and carried out to the thing 40 heat-treated at the temperature below 100 degrees C or more and the melting point of said synthetic pulp thru/or 95% of the weight. After desiccation, The separator for alkaline cells characterized by being obtained by carrying out heat weld at the temperature below the

melting point of said synthetic pulp and more than the melting point of said polyolefine system heat welding fiber binder is offered.
[0011] Moreover, according to this invention, the above-mentioned separator for alkaline cells with which said synthetic pulp carries out flash plate spinning of the emulsion, and is produced is offered.
[0012] Moreover, according to this invention, the above-mentioned separator for alkaline cells with which a surfactant exists on the preceding paragraph story or latter-part story of said heat treatment is offered.
[0013] Moreover, according to this invention, the above-mentioned separator for alkaline cells whose specific surface area of said polyolefine synthetic pulp is more than 0.1m2 / g is offered.
[0014] Moreover, according to this invention, the above-mentioned separator for alkaline cells said whose polyolefine synthetic pulp is a polyethylene synthetic pulp is offered.
[0015] Moreover, according to this invention, it is the process of the separator for alkaline cells according to claim 1, and the process of the separator for alkaline cells which carries out wet paper making of the polyolefine synthetic pulp heat-treated at the temperature below 100 degrees C or more and the melting point in dryness, and is characterized by drying by hot blast 100 degrees C or less is offered.
[0016] Moreover, according to this invention, paper making of the polyolefine system heat welding fiber binder 5 thru/or the 60 % of the weight is mixed and carried out to the heat-treated polyolefine system synthetic pulp 40 thru/or said 95% of the weight, and the process of the separator for alkaline cells characterized by heat-treating at the temperature below the melting point of a synthetic pulp is offered beyond the welding temperature of said polyolefine system heat welding fiber binder after desiccation.
[0017] Moreover, according to this invention, after heat-treating at the temperature below the melting point of said synthetic pulp, and beyond the welding temperature of said polyolefine system heat welding fiber binder, the process of the above-mentioned separator for alkaline cells processed with 80 thru/or 100-degree C hot water is offered.
[0018] Moreover, according to this invention, the process of the above-mentioned separator for alkaline cells with which a surfactant exists on the preceding paragraph story or latter-part story of said heat treatment is offered.
[0019] Moreover, according to this invention, the process of the above-mentioned separator for alkaline cells whose specific surface area of said polyolefine is more than 0.1m2 / g is offered.
[0020] Moreover, according to this invention, the process of the above-mentioned separator for alkaline cells said whose polyolefine synthetic pulp is a polyethylene synthetic pulp is offered.
[0021]
[Embodiment of the Invention] In this invention, after the polyvinyl alcohol content performed 1.0 thru/or 10.0% of the weight of a polyolefine synthetic pulp in dryness and heat-treats at the temperature below 100 degrees C or more and the melting point of the synthetic pulp concerned, it has the description important for the point formed as a separator for alkaline cells. Maintaining the hydrophilic grant nature of polyvinyl alcohol by performing this processing, adhesiveness can be made to mitigate, consequently a sheet with sufficient voidage is obtained.
[0022] Sufficient hydrophilic property for a separator is given by containing the polyvinyl alcohol content in the polyolefine system synthetic pulp in the above-mentioned range. When it is difficult for a polyvinyl alcohol content to give hydrophilic property sufficient at less than 1.0% for a separator and it exceeds 10.0%, it is in the inclination for it to become impossible to fully secure space for adhesion between synthetic-pulp fiber to carry out liquid retaining of a large next door and the electrolytic solution. In addition, although the polyvinyl alcohol adhering to a synthetic pulp reduces hydrophilic grant nature and adhesiveness by heat treatment, in process of wet paper making of a synthetic pulp, only hydrophilic grant nature is recovered to a surprising thing, and it serves as a material suitable as a separator for alkaline cells at it.
[0023] Under the present circumstances, as a synthetic pulp, flash plate spinning of a solution or the emulsion is carried out, it is produced, and the thing 0.1m2 / more than g has a desirable specific surface area. By a synthetic pulp's carrying out flash plate spinning of a solution or the emulsion, and producing it, it is fiber of many branching, and a mutual tangle is large, wet paper milling is possible, and a polyvinyl alcohol content can obtain the sheet of sufficient reinforcement 10.0% of the weight further 1.0 thru/or by considering as 1.5 thru/or 10.0 % of the weight preferably.
[0024] Hereafter, in order to simplify explanation of this invention, that to which the above and a polyvinyl alcohol content performed 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp in dryness, and heat-treated at the temperature below 100 degrees C or more and the melting point of the synthetic pulp concerned may only be called "a synthetic pulp [finishing / heat treatment]."
[0025] As a presentation of the separator for alkaline cells of this invention, there are a synthetic-pulp independent case and a case of the mixed stock of a synthetic pulp and a polyolefine system heat welding fiber binder. When creating a separator by the synthetic-pulp independent [finishing / heat treatment], it is 100 degrees C or less in temperature after

wet paper making, and is the description with important making it dry by hot blast. If desiccation is performed using the dryer of a drum type or a Yankee mold, since the closeness on the front face of a sheet will go up, it is not desirable in order for the absorbency of a separator to fall. In process of separator production, the property as separators, such as absorbency and solution retention, can be further raised by making a surfactant inherent. A surfactant may exist at which [of the preceding paragraph story of heat treatment, or a latter-part story] time.

[0026] After mixing a synthetic pulp [finishing / said heat treatment] and a polyolefine system heat welding fiber binder, wet paper making is carried out, in the case of mixed stock, it is beyond the welding temperature of a polyolefine system heat welding fiber binder after desiccation, and it heat-treats at the temperature below the melting point of a synthetic pulp. The reinforcement of a sheet increases by use of a heat welding fiber binder. After heat treatment, it processes with 80 thru/or 100-degree C hot water. By performing processing by this hot water, the hydrophilic property which once fell by said heat treatment reverts. The approach of drying as processing by hot water, after being preferably immersed in 80 thru/or 100-degree C hot water 30 seconds or more 10 seconds or more is mentioned. Moreover, desiccation is performed by hot blast 100 degrees C or less. When making a surfactant inherent in process of this separator production, the above-mentioned hot water processing is not performed.

[0027] Since a synthetic pulp cheap as a raw material can be used for the separator for alkaline cells of <description of separator for alkaline cells of this invention> this invention and it can manufacture it by the usual paper-making approach, it becomes what could consider as the cheap thing and was equipped with the fitness as a separator for alkaline cells. Moreover, from specific surface area using the polyolefine synthetic pulp 0.1m2 / more than g, as for the separator for alkaline cells of this invention, it excels especially in solution retention and has the outstanding physical properties on 0.10 thru/or 0.40mm and of [thickness / of a result] 400 % of the weight or more in the electrolyte holding rate of the potassium-hydroxide (KOH) solution of 35-% of the weight concentration.

[0028] The synthetic pulp used in <raw material material> this invention is well-known in itself, and the detail of a process is Encyclopedia of Chemical Technology 3rd ed.Vol.19 P420 thru/or 425. It is explained to the detail. As a desirable approach, after performing a solution flash plate or an emulsion flash plate, the approach of carrying out beating processing etc. is illustrated, for example. What was manufactured by the approach of carrying out a flash plate after producing an emulsion by making polyvinyl alcohol (PVA) into a hydrophilization agent, and carrying out beating by the refiner after that especially is used suitably. If it is in the synthetic pulp produced by the emulsion flash method, in process of disaggregation and paper making, polyvinyl alcohol and polyolefine have joined together firmly and it does not come out [polyvinyl alcohol separates and].

[0029] Although the copolymer of ethylene, such as polyethylene, polypropylene, a homopolymer of the olefin of 4-methyl pentene-1 grade, ethylene propylene rubber, an ethylene-1-butene copolymer, and ethylene-4-methyl pentene 1 copolymer, and other alpha olefins etc. is illustrated as polyolefine, polyethylene is suitably used from affinity with polyvinyl alcohol especially.

[0030] Moreover, as for the mean fiber length of a synthetic pulp, it is desirable that they are 0.1 thru/or 10mm. It is difficult for a tangle between fiber to make it a sheet substantially small in 0.1mm or less, and it difficult to consider as a homogeneous sheet by 10mm or more at wet paper making. Furthermore, as for the freshness of a synthetic pulp, it is desirable 1.0 thru/or that they are [g] 2.0 thru/or especially 10.0 seconds/g for 20 seconds /. Sheet reinforcement sufficient byg in 1.0 or less seconds /is not obtained, but there is an inclination for a sheet to become close in 20 seconds/g or more too much, and for solution retention to fall.

[0031] In this invention, to a synthetic pulp, 1.0 thru/or 10.0% of the weight of polyvinyl alcohol are added in order to give a hydrophilic property. Although usual polyvinyl alcohol can use as polyvinyl alcohol that there is no limit in any way, especially, more than 70 mol % is used for whenever [saponification], and 1500 or less thing is suitably used for polymerization degree. Less than [70 mol %], whenever [saponification] is in the inclination which is inferior in the grant nature of the hydrophilic property to a synthetic pulp, when there is an inclination for polyvinyl alcohol to deteriorate in the alkali electrolytic solution and polymerization degree exceeds 1500. Although a hydrophilic property disappears or falls by heat treatment of 100 degrees C or more as the synthetic pulp containing polyvinyl alcohol was mentioned above, the hydrophilization engine performance reverts again by processing with 80 thru/or 100-degree C hot water.

[0032] If an emulsion flash method has addition of polyvinyl alcohol, it is performed at an emulsion process. If it is in other processes, addition is performed at a beating process or the process after it.

[0033] In other modes of this invention, a polyolefine system heat welding fiber binder is used in order to give reinforcement to a sheet. As heat welding fiber, there are fiber which consists of a simple substance component, and a bicomponent fiber which consists of two or more sorts of components. The single fiber which carried out melt spinning of a synthetic pulp with the melting point lower than a principal member and the low melting point resin with the same

gestalt as a principal member as an example of the fiber of a simple substance component is mentioned. Although the sheath core which used high-melting resin as the heart and used low melting point resin as the sheath as a gestalt of a bicomponent fiber, an eccentric sheath-core type, or the side-by-side mold which stuck both sides is mentioned, each can be used in this invention.

[0034] As an example of high-melting resin, the homopolymer of the olefin of polyethylene, polypropylene, and 4-methyl pentene-1 grade is illustrated, and the copolymer of ethylene, such as polyethylene, ethylene propylene rubber, an ethylene-1-butene copolymer, and ethylene-4-methyl pentene 1 copolymer, and other alpha olefins etc. is mentioned as an example of low melting point resin. Inside, although a bicomponent fiber is used suitably, what used polypropylene for the heart and used low density polyethylene for the sheath is especially used suitably also in it.

[0035] Although there is especially no limit in the diameter of fiber and fiber length of a single fiber and a bicomponent fiber, as for the diameter of fiber, 0.1 thru/or a 20mm thing are used preferably, as for 0.1 thru/or 20 deniers, and fiber length. Although this binder fiber is used at 5 thru/or 60% of the weight of a rate to the synthetic pulp [finishing / said heat treatment] 40 thru/or 95 % of the weight, it is desirable to consider especially as 10 thru/or 30 % of the weight. Less than 5 % of the weight is not enough as the grant on the strength to a sheet, and if it exceeds 60 % of the weight, since the ratio of a synthetic pulp will fall, engine performance needed as a separator for alkaline cells, such as absorbency and solution retention, becomes less enough [% of the weight] as.

[0036] In <surfactant> this invention, in order to compensate disappearance or a fall of the hydrophilization engine performance of the polyvinyl alcohol brought about by heat treatment of the welding of heat welding fiber performed for accumulating, and in order to raise a hydrophilic property more in heat-treated synthetic-pulp independent use, adding a surfactant is recommended. As a class of surfactant, although an ion system and a non-ion system are usable, when using the surfactant of a non-ion system, five or more things are preferably used for an HLB value.

[0037] As an anionic surfactant, oleic acid potash soap, sodium stearate soap, Fatty-acid salts, such as mixed fatty-acid soda soap, sodium lauryl sulfate, lauryl sulfuric-acid triethanolamine, Alkylbenzene sulfonates, such as alkyl-sulfuric-acid ester salts, such as a lauryl ammonium sulfate, and sodium dodecylbenzenesulfonate, Alkylnaphthalenesulfonate, alkyl sulfo succinate, an alkyl diphenyl sulfonate, Alkyl phosphate, a polyoxyethylene alkyl-sulfuric-acid ester salt, a polyoxyethylene alkyl allyl compound sulfate salt, alkenyl succinate, an alkane sulfonate, etc. are illustrated.

[0038] As a nonionic surfactant, polyoxyethylene alkyl ether, the polyoxyethylene higher-alcohol ether, polyoxyethylene alkyl phenyl ether, oxyethylene oxypropylene block polymer, a sorbitan (monochrome, JI, Tori) alkylate, a polyoxyethylene sorbitan (monochrome, JI, Tori) alkylate, a glycerol alkylate, glyceride alkylene, a polyoxy-ethylene-glycol alkylate, a polyoxyethylene alkylate, polyoxyethylene alkylamine, etc. are illustrated.

[0039] Moreover, as a cationic surfactant, alkylamine acetate, an alkylamine hydrochloride, alkylamine oleate, alkyl trimethylammonium chloride, alkyl benzyl dimethylannmonium chloride, an alkyl betaine, alkyl dimethylamine oxide, etc. are illustrated.

[0040] Although the addition of a surface active agent changes also with amounts of the polyvinyl alcohol in the synthetic pulp which are a class and a principal member, it does not have 0.01 to the separator for alkaline cells, and especially its 0.5 thru/or 5% of the weight of addition is desirable 10% of the weight. In a synthetic-pulp independent system, although added by the humid sheet after desiccation processing or wet paper making, in mixed stock, addition of a surfactant may be performed on the humid sheet after heat welding processing of heat welding fiber, or wet paper making, and may usually use them together. Moreover, if it is in a non-ion system surfactant, the approach of carrying out addition adhesion is also adopted as a synthetic pulp from the beginning.

[0041] In <sheet-ized> this invention, after mixing the synthetic pulp [finishing / heat treatment] mentioned above or a synthetic pulp [finishing / heat treatment], and a polyolefine system heat welding fiber binder, a sheet is manufactured by carrying out wet paper milling. in wet paper milling, suction dehydration or suction dehydration, and light press dehydration are performed [a humid sheet] for **** raising **** in this humid sheet on a wire. If press dehydration is strengthened too much, it will become close [a sheet] and absorbency will fall. Since desiccation of a sheet was mentioned above, it is indispensable to carry out by hot blast. If it is when producing by the synthetic-pulp independent [finishing / heat treatment], 100 degrees C or less of desiccation after wet paper making are preferably performed by 40 thru/or 80-degree C hot blast. Moreover, although addition of a surfactant is performed if needed, if it is in this case, there is no limit of the above-mentioned drying temperature.

[0042] Heat treatment is performed next in the mixed stock of a synthetic pulp [finishing / heat treatment] and a polyolefine system heat welding fiber binder. It is desirable to also perform heat treatment by hot blast, and it is performed at the temperature below the melting point of the polyolefine synthetic pulp of a principal member more than the melting point of the low melting point component of heat welding nature fiber, or a heat welding component. Preferably, heat treatment is performed [melting point / of the welding component of heat welding fiber] in 5 degrees

C or less from the melting point of 5 degrees C or more and a polyolefine synthetic pulp. Under the present circumstances, a surfactant is made inherent or processing by 80 thru/or 100-degree C hot water is performed after heat treatment.

[0043] If it is in hot water processing, desiccation is performed after being preferably immersed in 80 thru/or 100-degree C hot water 30 seconds or more 10 seconds or more. Under the present circumstances, 100 degrees C or less, desiccation is preferably performed by 40 thru/or 80-degree C hot blast, and is usually performed all over a drying furnace. The drying time is suitably determined by factors, such as airflow, temperature, and a basis weight. If drying temperature exceeds 100 degrees C, since the hydrophilic property of a sheet will disappear thru/or fall, it is not desirable. Moreover, since the closeness on the front face of a sheet goes up when a drum-type dryer is used also on this occasion, it causes an absorbency fall and is not desirable. In addition, when addition of a surfactant is performed, there is no limit in the above-mentioned drying temperature.

[0044] as an example of a paper machine, paper machines, such as a cylinder mould, a long network, a short network, an inclination wire mold, and a twin wire type, mention -- having -- any -- although -- although it is usable, it is desirable to use the paper machine of a long network, a short network, or an inclination wire mold from the point of attachment of a suction box.

[0045]

[Effect of the Invention] Since according to this invention it excels in alkali resistance, a polyolefine synthetic pulp with large surface area is used as a material of a separator, the polyvinyl alcohol firmly combined with the synthetic pulp as a hydrophilic agent is used, it is stabilized over a long period of time and a hydrophilic property is maintained even if it is in the alkali electrolytic solution, the separator for alkaline cells excellent in the absorbency and solution retention of the electrolytic solution is offered. Moreover, since it is added for hydrophilic recovery of polyvinyl alcohol, and a surface active agent is little compared with addition of the surface active agent aiming only at the conventional hydrophilic grant and ends even if it is, when adding a surface active agent, it can control doing the bad influence to an electrode with the degradation object of a surface active agent as much as possible. Furthermore, when polyolefine system heat welding fiber is used for a synthetic pulp [finishing / heat treatment] as a binder, the reinforcement by which the obtained separator for alkaline cells is needed at the time of cell assembly operation is fully held.

[0046]

[Example] Hereafter, based on an example and the example of a comparison, this invention is explained concretely. In addition, measurement of each physical properties was performed by the following approach among the example.

[0047] N2 by the <measurement of specific surface area> BET adsorption method It measures by the amount of adsorption of gas.

[0048] It is a <measurement of freshness> sheet basis weight 500g/m2 Besides changing, the time amount which water discharge takes is measured per second according to the specification of TAPPI-T221. Freshness is expressed by the time amount of per g of pulp.

[0049] a <measuring method of electrolyte holding rate of the electrolytic solution> test piece -- 100x100mm -- carrying out -- three sheets -- each -- a total of three per every sheet are mostly extracted from a center section. The weight in a room temperature condition is measured to 1mg. Next, after having opened the test piece in the potassium-hydroxide (KOH) solution of the 35-% of the weight concentration of a room temperature (25**2 degrees C), dipping in it and making it leave it more than for 30 minutes, it pulled up out of liquid, one angle of a test piece was clipped and hung, the test piece weight of 10 minutes after was measured, and it asked for the electrolyte holding rate by the following formula.

$$A_0 = \frac{W_1 - W_0}{W_0}$$

It is A0 here. : Electrolyte holding rate W0 of the electrolytic solution : Weight of the test piece at the time of desiccation (g)

W1 : Weight of the test piece at the time of **** (g)

[0050] The test piece with a <absorbency evaluation approach> die length [of 20cm] and a width of face of 1.5cm was extracted, on the leveled rod, it hung down perpendicularly, 5mm of lower limits of a test piece was dipped in the potassium-hydroxide (KOH) solution of concentration 35% of the weight, and a stop and the height in which the KOH solution went up after 5 minutes were measured for upper limit.

[0051] A test piece is opened in the potassium-hydroxide (KOH) solution of concentration the <alkali-proof evaluation

approach> 35% of the weight, and it is immersed for seven days at a room temperature. Then, it rinsed until it reached the point of neutralization, and measurement of absorbency [the condition of having made it drying] was performed.
[0052] The <measuring method of sheet reinforcement> test piece was made into width of face of 15mm, and die length of 100mm, and was pulled the rate for 100mm/in the die-length direction, the reinforcement at the time of fracture was measured 5 times, and the average was calculated.
[0053] In the autoclave with an agitator of the 30l. capacity possessing a <example 1> baffle plate, it is 10l. (23 degrees C) of n-hexanes, Having supplied 10l. (23 degrees C) of water, 1,000g of high-density-polyethylene resin, and [4% water-solution viscosity (20 degrees C):4.6 thru/or 6.0cps [PVA, degree:of saponification99%,], trade name Gosenol NL-05, and Nippon Synthetic Chemical Industry Co., Ltd. make] made from polyvinyl alcohol 50g, and agitating by rotational frequency 900rpm, the temperature up was carried out until the solution temperature of mixed liquor became 140 degrees C. Subsequently, the solution temperature of mixed liquor was held at 140 degrees C, further, churning was continued for 30 minutes and suspension was obtained.
[0054] Subsequently, from the nozzle with a diameter [of 3mm], and a die length of 20mm in which this suspension was attached by the autoclave, through the pipe, it was made to spout in the drum under nitrogen-gas-atmosphere mind and the pressure of -400mmHg (flash plate), and the fibrous object was obtained.
[0055] Subsequently, after making a fibrous object into the water slurry of 10g [/l.] concentration within a receptor, beating was carried out by the disk mold refiner with a diameter of 12 inches, and the pulp-like object was obtained. Thus, the physical properties of the obtained polyethylene synthetic pulp are shown below.
Mean fiber length 1.5mm specific surface area 9.8m2 / g freshness 15.0 sec/gPVA content 4.0-% of the weight melting point 135 degrees C [0056] Circuit system hot air drying equipment performed the above-mentioned high-density-polyethylene synthetic pulp by dryness, and heat treatment was performed for 5 minutes at 125 degrees C. The high-density-polyethylene synthetic pulp after heat treatment was disaggregated in the JIS mold pulper, and paper making was carried out with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet-like object was obtained. The physical properties of the obtained sheet are shown in Table -1.
[0057] The polyethylene synthetic pulp was obtained like the example 1 except setting to 30g the amount of the polyvinyl alcohol added into a <example 2> autoclave. The physical properties are shown below.
Mean fiber length 1.2mm specific surface area 8.2m2 / g freshness 7.5 sec/gPVA content 3.0-% of the weight melting point Circuit system hot air drying equipment performed heat treatment for the synthetic pulp of the 135 degree-C above for 5 minutes at 125 degrees C like the example 1. The sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making to the high-density-polyethylene synthetic pulp after heat treatment with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet-like object was obtained. Further, circuit system hot air drying equipment performed this sheet, and heat treatment was performed for 5 minutes at 125 degrees C. Then, it was immersed in 90-degree C hot water for 1 minute, circuit system hot air drying equipment performed desiccation for 30 minutes at 50 degrees C again, and the target sheet was obtained. The physical properties of the obtained sheet are shown in Table -1.
[0058] The polyethylene synthetic pulp was obtained like the example 1 except setting to 20g the amount of polyvinyl alcohol added into a <example 3> autoclave. The physical properties are shown below.
Mean fiber length 1.2mm specific surface area 6.2m2 / g freshness 5.0 sec/gPVA content 2.0-% of the weight melting point Circuit system hot air drying equipment performed heat treatment for the 135-degree-C above-mentioned synthetic pulp for 5 minutes at 125 degrees C like the example 1. The sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making to the high-density-polyethylene synthetic pulp after heat treatment with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet-like object was obtained. Further, circuit system hot air drying equipment performed this sheet, and heat treatment was performed for 5 minutes at 125 degrees C. Then, 1 % of the weight was added for the surface active agent (dialkyl sulfo sodium succinate) in the water solution to the sheet, circuit system hot air drying equipment performed desiccation for 30 minutes at 50 degrees C again, and the target sheet was obtained. The physical properties of the obtained sheet are shown in Table -1.
[0059] Without heat-treating the high-density-polyethylene synthetic pulp obtained in the <example 1 of comparison> example 1, immediately, it disaggregated in the JIS mold pulper and paper making was carried out with the 25x25cm

square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour or more, and the sheet was obtained. The physical properties of this sheet are shown in Table -2.

[0060] Without heat-treating the high-density-polyethylene synthetic pulp obtained in the <example 2 of comparison> example 2, immediately, the sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making with the 25x25cm square shape paper machine. The target sheet was obtained like the example 2 below. The physical properties of the obtained sheet are shown in Table -2.

[0061] Without heat-treating the high-density-polyethylene synthetic pulp obtained in the <example 3 of comparison> example 3, immediately, the sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making with the 25x25cm square shape paper machine. The target sheet was obtained like the example 3 below. The physical properties of the obtained sheet are shown in Table -2.

[0062] The polyethylene synthetic pulp was obtained like the example 1 except setting to 4g the amount of polyvinyl alcohol added into the <example 4 of comparison> autoclave. The physical properties of the obtained synthetic pulp are shown below.

Mean fiber length 1.5mm specific surface area 5.4m2 / g freshness 0.5 sec/gPVA content 0.4-% of the weight melting point Circuit system hot air drying equipment performed the 135-degree-C above-mentioned high-density-polyethylene synthetic pulp by dryness, and heat treatment was performed for 5 minutes at 125 degrees C. The high-density-polyethylene synthetic pulp after heat treatment was disaggregated in the JIS form pulper, and paper making was carried out with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet was obtained. The physical properties of the obtained sheet are shown in Table -2.

[0063] The performance test same about the separator of the <example 5 of comparison> polypropylene dry type nonwoven fabric (melt spinning type) was performed. The result is shown in Table -2.

[0064] from the result of Table -1 and 2, it is admitted that an electrolyte holding rate, absorbency, and alkali resistance boil the separator for alkaline cells of an example 1 markedly compared with the separator for alkaline cells used without heat-treating the same synthetic pulp of the example 1 of a comparison, and it excels. Moreover, using the same synthetic pulp, in the example, an example 2, the example 2 of a comparison and an example 3, and the example 3 of a comparison are heat-treated and used, and are used by the example of a comparison, respectively, without heat-treating. Even in this case, it is admitted that the direction of an example is excellent in an electrolyte holding rate, absorbency, and alkali resistance.

[0065]

表－1

	実施例1	実施例2	実施例3
坪量 [g/m²]	60	60	60
厚み [mm]	0.31	0.30	0.31
保液率 [%]	587	433	613
吸液性 [mm]	38.9	46.0	58.3
耐アルカリ性[mm]	44.5	43.2	50.3
シート強度 [kg/15mm]	0.87	0.97	0.88

[0066]

表－2

	比較例１	比較例２	比較例３	比較例４	比較例５
坪量 [g/m²]	６０	６０	６０	６０	３０
厚み [mm]	０．３１	０．３０	０．３１	０．３１	０．１２
保液率 [%]	４５３	２５１	４００	０	３３６
吸液性 [mm]	１４．３	１６．８	３６．０	０	４６．５
耐アルカリ性[mm]	１５．６	１６．３	３１．２	測定せず	０
シート強度 [kg/15mm]	１．１０	１．０２	０．９２	０．０２	０．５４

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the separator for alkaline cells which was excellent in the hydrophilic property made from the specific synthetic pulp in more detail, and its process about the separator used for alkaline cells, such as a nickel-cadmium battery and a nickel hydoride battery, and its process.

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PRIOR ART

[Description of the Prior Art] The nonwoven fabric of the polyamide fiber excellent in the hydrophilic property and the nonwoven fabric of polyolefine fiber excellent in alkali resistance are conventionally used for the separator for alkaline cells. However, by using it repeatedly, it decomposes in the alkali electrolytic solution, and a polyamide fiber generates nitrogen oxides, and has the fault referred to as contracting a battery life. Moreover, although, as for polyolefine fiber, hydrophilic processing is made by the surfactant since it is hydrophobicity originally, it deteriorates gradually in the electrolytic solution, the engine performance is lost, and a surfactant has the fault referred to as that a hydrophilic property is lost soon.
[0003] Moreover, the nonwoven fabric of sulfonation polyolefine fiber excellent in the hydrophilic property which improved the fault of polyolefine fiber has also come to be used for recent years.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since according to this invention it excels in alkali resistance, a polyolefine synthetic pulp with large surface area is used as a material of a separator, the polyvinyl alcohol firmly combined with the synthetic pulp as a hydrophilic agent is used, it is stabilized over a long period of time and a hydrophilic property is maintained even if it is in the alkali electrolytic solution, the separator for alkaline cells excellent in the absorbency and solution retention of the electrolytic solution is offered. Moreover, since it is added for hydrophilic recovery of polyvinyl alcohol, and a surface active agent is little compared with addition of the surface active agent aiming only at the conventional hydrophilic grant and ends even if it is, when adding a surface active agent, it can control doing the bad influence to an electrode with the degradation object of a surface active agent as much as possible. Furthermore, when polyolefine system heat welding fiber is used for a synthetic pulp [finishing / heat treatment] as a binder, the reinforcement by which the obtained separator for alkaline cells is needed at the time of cell assembly operation is fully held.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, concentrated sulfuric acid or an oleum is used for the aforementioned sulfonation polyolefine fiber in process of sulfonation, and since the yield is bad, it is the high thing of cost.

[0005] this invention person develops the separator for alkaline cells excellent in a hydrophilic property, solution retention, and endurance, and is doing patent application as Japanese Patent Application No. No. 329259 [seven to] while he can manufacture cheaply by recognizing the trouble of this conventional technique, repeating research for the purpose of the amelioration, and being made from a specific synthetic pulp.

[0006] By retesting said invention and using other different materials from the above-mentioned invention as a synthetic pulp of the above-mentioned material in the process which continues research further, this invention person did the knowledge of the separator for alkaline cells which has the property which was excellent like the above-mentioned invention being obtained, did based on this knowledge, and completed this invention.

[0007]

[Objects of the Invention] Then, the purpose of this invention can be manufactured cheaply and is to offer the separator for alkaline cells excellent in a hydrophilic property, solution retention, and endurance, and its process.

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MEANS

[Means for Achieving the Goal] This invention is proposed in order to attain said purpose, and it has the description at the point using the polyolefine synthetic pulp after performing specific processing as a material.
[0009] That is, according to this invention, the separator for alkaline cells with which a polyvinyl alcohol content is characterized by being obtained by carrying out wet paper making after heat-treating 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp in dryness at the temperature below 100 degrees C or more and the melting point of said synthetic pulp is offered.
[0010] Moreover, the thing which according to this invention a polyvinyl alcohol content mixes and carries out wet paper making of the polyolefine system heat welding fiber binder 5 thru/or the 60 % of the weight to the thing 40 which heat-treated 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp in dryness at the temperature below 100 degrees C or more and the melting point of said synthetic pulp thru/or 95% of the weight, and is done for heat weld after desiccation at the temperature below the melting point of said synthetic pulp, and more than the melting point of said polyolefine system heat welding fiber binder The separator for alkaline cells characterized by being obtained is offered.
[0011] Moreover, according to this invention, the above-mentioned separator for alkaline cells with which said synthetic pulp carries out flash plate spinning of the emulsion, and is produced is offered.
[0012] Moreover, according to this invention, the above-mentioned separator for alkaline cells with which a surfactant exists on the preceding paragraph story or latter-part story of said heat treatment is offered.
[0013] Moreover, according to this invention, the above-mentioned separator for alkaline cells whose specific surface area of said polyolefine synthetic pulp is more than 0.1m2 / g is offered.
[0014] Moreover, according to this invention, the above-mentioned separator for alkaline cells said whose polyolefine synthetic pulp is a polyethylene synthetic pulp is offered.
[0015] Moreover, according to this invention, it is the process of the separator for alkaline cells according to claim 1, and the process of the separator for alkaline cells which carries out wet paper making of the polyolefine synthetic pulp heat-treated at the temperature below 100 degrees C or more and the melting point in dryness, and is characterized by drying by hot blast 100 degrees C or less is offered.
[0016] Moreover, according to this invention, paper making of the polyolefine system heat welding fiber binder 5 thru/or the 60 % of the weight is mixed and carried out to the heat-treated polyolefine system synthetic pulp 40 thru/or said 95% of the weight, and the process of the separator for alkaline cells characterized by heat-treating at the temperature below the melting point of a synthetic pulp is offered beyond the welding temperature of said polyolefine system heat welding fiber binder after desiccation.
[0017] Moreover, according to this invention, after heat-treating at the temperature below the melting point of said synthetic pulp, and beyond the welding temperature of said polyolefine system heat welding fiber binder, the process of the above-mentioned separator for alkaline cells processed with 80 thru/or 100-degree C hot water is offered.
[0018] Moreover, according to this invention, the process of the above-mentioned separator for alkaline cells with which a surfactant exists on the preceding paragraph story or latter-part story of said heat treatment is offered.
[0019] Moreover, according to this invention, the process of the above-mentioned separator for alkaline cells whose specific surface area of said polyolefine is more than 0.1m2 / g is offered.
[0020] Moreover, according to this invention, the process of the above-mentioned separator for alkaline cells said whose polyolefine synthetic pulp is a polyethylene synthetic pulp is offered.
[0021]
[Embodiment of the Invention] In this invention, after the polyvinyl alcohol content performed 1.0 thru/or 10.0% of the weight of a polyolefine synthetic pulp in dryness and heat-treats at the temperature below 100 degrees C or more and

the melting point of the synthetic pulp concerned, it has the description important for the point formed as a separator for alkaline cells. Maintaining the hydrophilic grant nature of polyvinyl alcohol by performing this processing, adhesiveness can be made to mitigate, consequently a sheet with sufficient voidage is obtained.

[0022] Sufficient hydrophilic property for a separator is given by containing the polyvinyl alcohol content in the polyolefine system synthetic pulp in the above-mentioned range. When it is difficult for a polyvinyl alcohol content to give hydrophilic property sufficient at less than 1.0% for a separator and it exceeds 10.0%, it is in the inclination for it to become impossible to fully secure space for adhesion between synthetic-pulp fiber to carry out liquid retaining of a large next door and the electrolytic solution. In addition, although the polyvinyl alcohol adhering to a synthetic pulp reduces hydrophilic grant nature and adhesiveness by heat treatment, in process of wet paper making of a synthetic pulp, only hydrophilic grant nature is recovered to a surprising thing, and it serves as a material suitable as a separator for alkaline cells at it.

[0023] Under the present circumstances, as a synthetic pulp, flash plate spinning of a solution or the emulsion is carried out, it is produced, and the thing 0.1m2 / more than g has a desirable specific surface area. By a synthetic pulp's carrying out flash plate spinning of a solution or the emulsion, and producing it, it is fiber of many branching, and a mutual tangle is large, wet paper milling is possible, and a polyvinyl alcohol content can obtain the sheet of sufficient reinforcement 10.0% of the weight further 1.0 thru/or by considering as 1.5 thru/or 10.0 % of the weight preferably.

[0024] Hereafter, in order to simplify explanation of this invention, that to which the above and a polyvinyl alcohol content performed 1.0 thru/or 10.0% of the weight of a polyolefine system synthetic pulp in dryness, and heat-treated at the temperature below 100 degrees C or more and the melting point of the synthetic pulp concerned may only be called "a synthetic pulp [finishing / heat treatment]."

[0025] As a presentation of the separator for alkaline cells of this invention, there are a synthetic-pulp independent case and a case of the mixed stock of a synthetic pulp and a polyolefine system heat welding fiber binder. When creating a separator by the synthetic-pulp independent [finishing / heat treatment], it is 100 degrees C or less in temperature after wet paper making, and is the description with important making it dry by hot blast. If desiccation is performed using the dryer of a drum type or a Yankee mold, since the closeness on the front face of a sheet will go up, it is not desirable in order for the absorbency of a separator to fall. In process of separator production, the property as separators, such as absorbency and solution retention, can be further raised by making a surfactant inherent. A surfactant may exist at which [of the preceding paragraph story of heat treatment, or a latter-part story] time.

[0026] After mixing a synthetic pulp [finishing / said heat treatment] and a polyolefine system heat welding fiber binder, wet paper making is carried out, in the case of mixed stock, it is beyond the welding temperature of a polyolefine system heat welding fiber binder after desiccation, and it heat-treats at the temperature below the melting point of a synthetic pulp. The reinforcement of a sheet increases by use of a heat welding fiber binder. After heat treatment, it processes with 80 thru/or 100-degree C hot water. By performing processing by this hot water, the hydrophilic property which once fell by said heat treatment reverts. The approach of drying as processing by hot water, after being preferably immersed in 80 thru/or 100-degree C hot water 30 seconds or more 10 seconds or more is mentioned. Moreover, desiccation is performed by hot blast 100 degrees C or less. When making a surfactant inherent in process of this separator production, the above-mentioned hot water processing is not performed.

[0027] Since a synthetic pulp cheap as a raw material can be used for the separator for alkaline cells of <description of separator for alkaline cells of this invention> this invention and it can manufacture it by the usual paper-making approach, it becomes what could consider as the cheap thing and was equipped with the fitness as a separator for alkaline cells. Moreover, from specific surface area using the polyolefine synthetic pulp 0.1m2 / more than g, as for the separator for alkaline cells of this invention, it excels especially in solution retention and has the outstanding physical properties on 0.10 thru/or 0.40mm and of [thickness / of a result] 400 % of the weight or more in the electrolyte holding rate of the potassium-hydroxide (KOH) solution of 35-% of the weight concentration.

[0028] The synthetic pulp used in <raw material material> this invention is well-known in itself, and the detail of a process is Encyclopedia of Chemical Technology 3rd ed.Vol.19 P420 thru/or 425. It is explained to the detail. As a desirable approach, after performing a solution flash plate or an emulsion flash plate, the approach of carrying out beating processing etc. is illustrated, for example. What was manufactured by the approach of carrying out a flash plate after producing an emulsion by making polyvinyl alcohol (PVA) into a hydrophilization agent, and carrying out beating by the refiner after that especially is used suitably. If it is in the synthetic pulp produced by the emulsion flash method, in process of disaggregation and paper making, polyvinyl alcohol and polyolefine have joined together firmly and it does not come out [polyvinyl alcohol separates and].

[0029] Although the copolymer of ethylene, such as polyethylene, polypropylene, a homopolymer of the olefin of 4-methyl pentene-1 grade, ethylene propylene rubber, an ethylene-1-butene copolymer, and ethylene-4-methyl pentene 1

copolymer, and other alpha olefins etc. is illustrated as polyolefine, polyethylene is suitably used from affinity with polyvinyl alcohol especially.

[0030] Moreover, as for the mean fiber length of a synthetic pulp, it is desirable that they are 0.1 thru/or 10mm. It is difficult for a tangle between fiber to make it a sheet substantially small in 0.1mm or less, and it difficult to consider as a homogeneous sheet by 10mm or more at wet paper making. Furthermore, as for the freshness of a synthetic pulp, it is desirable 1.0 thru/or that they are [g] 2.0 thru/or especially 10.0 seconds/g for 20 seconds /. Sheet reinforcement sufficient byg in 1.0 or less seconds /is not obtained, but there is an inclination for a sheet to become close in 20 seconds/g or more too much, and for solution retention to fall.

[0031] In this invention, to a synthetic pulp, 1.0 thru/or 10.0% of the weight of polyvinyl alcohol are added in order to give a hydrophilic property. Although usual polyvinyl alcohol can use as polyvinyl alcohol that there is no limit in any way, especially, more than 70 mol % is used for whenever [saponification], and 1500 or less thing is suitably used for polymerization degree. Less than [70 mol %], whenever [saponification] is in the inclination which is inferior in the grant nature of the hydrophilic property to a synthetic pulp, when there is an inclination for polyvinyl alcohol to deteriorate in the alkali electrolytic solution and polymerization degree exceeds 1500. Although a hydrophilic property disappears or falls by heat treatment of 100 degrees C or more as the synthetic pulp containing polyvinyl alcohol was mentioned above, the hydrophilization engine performance reverts again by processing with 80 thru/or 100-degree C hot water.

[0032] If an emulsion flash method has addition of polyvinyl alcohol, it is performed at an emulsion process. If it is in other processes, addition is performed at a beating process or the process after it.

[0033] In other modes of this invention, a polyolefine system heat welding fiber binder is used in order to give reinforcement to a sheet. As heat welding fiber, there are fiber which consists of a simple substance component, and a bicomponent fiber which consists of two or more sorts of components. The single fiber which carried out melt spinning of a synthetic pulp with the melting point lower than a principal member and the low melting point resin with the same gestalt as a principal member as an example of the fiber of a simple substance component is mentioned. Although the sheath core which used high-melting resin as the heart and used low melting point resin as the sheath as a gestalt of a bicomponent fiber, an eccentric sheath-core type, or the side-by-side mold which stuck both sides is mentioned, each can be used in this invention.

[0034] As an example of high-melting resin, the homopolymer of the olefin of polyethylene, polypropylene, and 4-methyl pentene-1 grade is illustrated, and the copolymer of ethylene, such as polyethylene, ethylene propylene rubber, an ethylene-1-butene copolymer, and ethylene-4-methyl pentene 1 copolymer, and other alpha olefins etc. is mentioned as an example of low melting point resin. Inside, although a bicomponent fiber is used suitably, what used polypropylene for the heart and used low density polyethylene for the sheath is especially used suitably also in it.

[0035] Although there is especially no limit in the diameter of fiber and fiber length of a single fiber and a bicomponent fiber, as for the diameter of fiber, 0.1 thru/or a 20mm thing are used preferably, as for 0.1 thru/or 20 deniers, and fiber length. Although this binder fiber is used at 5 thru/or 60% of the weight of a rate to the synthetic pulp [finishing / said heat treatment] 40 thru/or 95 % of the weight, it is desirable to consider especially as 10 thru/or 30 % of the weight. Less than 5 % of the weight is not enough as the grant on the strength to a sheet, and if it exceeds 60 % of the weight, since the ratio of a synthetic pulp will fall, engine performance needed as a separator for alkaline cells, such as absorbency and solution retention, becomes less enough [% of the weight] as.

[0036] In <surfactant> this invention, in order to compensate disappearance or a fall of the hydrophilization engine performance of the polyvinyl alcohol brought about by heat treatment of the welding of heat welding fiber performed for accumulating, and in order to raise a hydrophilic property more in heat-treated synthetic-pulp independent use, adding a surfactant is recommended. As a class of surfactant, although an ion system and a non-ion system are usable, when using the surfactant of a non-ion system, five or more things are preferably used for an HLB value.

[0037] As an anionic surfactant Fatty-acid salts, such as **, oleic acid potash soap, sodium stearate soap, and mixed fatty-acid soda soap, Alkyl-sulfuric-acid ester salts, such as sodium lauryl sulfate, lauryl sulfuric-acid triethanolamine, and a lauryl ammonium sulfate, Alkylbenzene sulfonates, such as sodium dodecylbenzenesulfonate, Alkylnaphthalenesulfonate, alkyl sulfo succinate, an alkyl diphenyl sulfonate, Alkyl phosphate, a polyoxyethylene alkyl-sulfuric-acid ester salt, a polyoxyethylene alkyl allyl compound sulfate salt, alkenyl succinate, an alkane sulfonate, etc. are illustrated.

[0038] As a nonionic surfactant, polyoxyethylene alkyl ether, the polyoxyethylene higher-alcohol ether, polyoxyethylene alkyl phenyl ether, oxyethylene oxypropylene block polymer, a sorbitan (monochrome, JI, Tori) alkylate, a polyoxyethylene sorbitan (monochrome, JI, Tori) alkylate, a glycerol alkylate, glyceride alkylene, a polyoxy-ethylene-glycol alkylate, a polyoxyethylene alkylate, polyoxyethylene alkylamine, etc. are illustrated.

[0039] Moreover, as a cationic surfactant, alkylamine acetate, an alkylamine hydrochloride, alkylamine oleate, alkyl trimethylammonium chloride, alkyl benzyl dimethylannmonium chloride, an alkyl betaine, alkyl dimethylamine oxide, etc. are illustrated.
[0040] Although the addition of a surface active agent changes also with amounts of the polyvinyl alcohol in the synthetic pulp which are a class and a principal member, it does not have 0.01 to the separator for alkaline cells, and especially its 0.5 thru/or 5% of the weight of addition is desirable 10% of the weight. In a synthetic-pulp independent system, although added by the humid sheet after desiccation processing or wet paper making, in mixed stock, addition of a surfactant may be performed on the humid sheet after heat welding processing of heat welding fiber, or wet paper making, and may usually use them together. Moreover, if it is in a non-ion system surfactant, the approach of carrying out addition adhesion is also adopted as a synthetic pulp from the beginning.
[0041] In <sheet-ized> this invention, after mixing the synthetic pulp [finishing / heat treatment] mentioned above or a synthetic pulp [finishing / heat treatment], and a polyolefine system heat welding fiber binder, a sheet is manufactured by carrying out wet paper milling. in wet paper milling, suction dehydration or suction dehydration, and light press dehydration are performed [a humid sheet] for **** raising **** in this humid sheet on a wire. If press dehydration is strengthened too much, it will become close [a sheet] and absorbency will fall. Since desiccation of a sheet was mentioned above, it is indispensable to carry out by hot blast. If it is when producing by the synthetic-pulp independent [finishing / heat treatment], 100 degrees C or less of desiccation after wet paper making are preferably performed by 40 thru/or 80-degree C hot blast. Moreover, although addition of a surfactant is performed if needed, if it is in this case, there is no limit of the above-mentioned drying temperature.
[0042] Heat treatment is performed next in the mixed stock of a synthetic pulp [finishing / heat treatment] and a polyolefine system heat welding fiber binder. It is desirable to also perform heat treatment by hot blast, and it is performed at the temperature below the melting point of the polyolefine synthetic pulp of a principal member more than the melting point of the low melting point component of heat welding nature fiber, or a heat welding component. Preferably, heat treatment is performed [melting point / of the welding component of heat welding fiber] in 5 degrees C or less from the melting point of 5 degrees C or more and a polyolefine synthetic pulp. Under the present circumstances, a surfactant is made inherent or processing by 80 thru/or 100-degree C hot water is performed after heat treatment.
[0043] If it is in hot water processing, desiccation is performed after being preferably immersed in 80 thru/or 100-degree C hot water 30 seconds or more 10 seconds or more. Under the present circumstances, 100 degrees C or less, desiccation is preferably performed by 40 thru/or 80-degree C hot blast, and is usually performed all over a drying furnace. The drying time is suitably determined by factors, such as airflow, temperature, and a basis weight. If drying temperature exceeds 100 degrees C, since the hydrophilic property of a sheet will disappear thru/or fall, it is not desirable. Moreover, since the closeness on the front face of a sheet goes up when a drum-type dryer is used also on this occasion, it causes an absorbency fall and is not desirable. In addition, when addition of a surfactant is performed, there is no limit in the above-mentioned drying temperature.
[0044] as an example of a paper machine, paper machines, such as a cylinder mould, a long network, a short network, an inclination wire mold, and a twin wire type, mention -- having -- any -- although -- although it is usable, it is desirable to use the paper machine of a long network, a short network, or an inclination wire mold from the point of attachment of a suction box.

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EXAMPLE

[Example] Hereafter, based on an example and the example of a comparison, this invention is explained concretely. In addition, measurement of each physical properties was performed by the following approach among the example.
[0047] N2 by the <measurement of specific surface area> BET adsorption method It measures by the amount of adsorption of gas.
[0048] It is a <measurement of freshness> sheet basis weight 500g/m2 Besides changing, the time amount which water discharge takes is measured per second according to the specification of TAPPI-T221. Freshness is expressed by the time amount of per g of pulp.
[0049] a <measuring method of electrolyte holding rate of the electrolytic solution> test piece -- 100x100mm -- carrying out -- three sheets -- each -- a total of three per every sheet are mostly extracted from a center section. The weight in a room temperature condition is measured to 1mg. Next, after having opened the test piece in the potassium-hydroxide (KOH) solution of the 35-% of the weight concentration of a room temperature (25**2 degrees C), dipping in it and making it leave it more than for 30 minutes, it pulled up out of liquid, one angle of a test piece was clipped and hung, the test piece weight of 10 minutes after was measured, and it asked for the electrolyte holding rate by the following formula.

$$A_0 = \frac{W_1 - W_0}{W_0}$$

It is A0 here. : Electrolyte holding rate W0 of the electrolytic solution : Weight of the test piece at the time of desiccation (g)
W1 : Weight of the test piece at the time of **** (g)
[0050] The test piece with a <absorbency evaluation approach> die length [of 20cm] and a width of face of 1.5cm was extracted, on the leveled rod, it hung down perpendicularly, 5mm of lower limits of a test piece was dipped in the potassium-hydroxide (KOH) solution of concentration 35% of the weight, and a stop and the height in which the KOH solution went up after 5 minutes were measured for upper limit.
[0051] A test piece is opened in the potassium-hydroxide (KOH) solution of concentration the <alkali-proof evaluation approach> 35% of the weight, and it is immersed for seven days at a room temperature. Then, it rinsed until it reached the point of neutralization, and measurement of absorbency [the condition of having made it drying] was performed.
[0052] The <measuring method of sheet reinforcement> test piece was made into width of face of 15mm, and die length of 100mm, and was pulled the rate for 100mm/in the die-length direction, the reinforcement at the time of fracture was measured 5 times, and the average was calculated.
[0053] In the autoclave with an agitator of the 30l. capacity possessing a <example 1> baffle plate, it is 10l. (23 degrees C) of n-hexanes, Having supplied 10l. (23 degrees C) of water, 1,000g of high-density-polyethylene resin, and [4% water-solution viscosity (20 degrees C):4.6 thru/or 6.0cps [PVA, degree:of saponification99%,], trade name Gosenol NL-05, and Nippon Synthetic Chemical Industry Co., Ltd. make] made from polyvinyl alcohol 50g, and agitating by rotational frequency 900rpm, the temperature up was carried out until the solution temperature of mixed liquor became 140 degrees C. Subsequently, the solution temperature of mixed liquor was held at 140 degrees C, further, churning was continued for 30 minutes and suspension was obtained.
[0054] Subsequently, from the nozzle with a diameter [of 3mm], and a die length of 20mm in which this suspension was attached by the autoclave, through the pipe, it was made to spout in the drum under nitrogen-gas-atmosphere mind and the pressure of -400mmHg (flash plate), and the fibrous object was obtained.
[0055] Subsequently, after making a fibrous object into the water slurry of 10g [/l.] concentration within a receptor,

beating was carried out by the disk mold refiner with a diameter of 12 inches, and the pulp-like object was obtained. Thus, the physical properties of the obtained polyethylene synthetic pulp are shown below.
Mean fiber length 1.5mm specific surface area 9.8m2 / g freshness 15.0 sec/gPVA content 4.0-% of the weight melting point 135 degrees C [0056] Circuit system hot air drying equipment performed the above-mentioned high-density-polyethylene synthetic pulp by dryness, and heat treatment was performed for 5 minutes at 125 degrees C. The high-density-polyethylene synthetic pulp after heat treatment was disaggregated in the JIS mold pulper, and paper making was carried out with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet-like object was obtained. The physical properties of the obtained sheet are shown in Table -1.
[0057] The polyethylene synthetic pulp was obtained like the example 1 except setting to 30g the amount of the polyvinyl alcohol added into a <example 2> autoclave. The physical properties are shown below.
Mean fiber length 1.2mm specific surface area 8.2m2 / g freshness 7.5 sec/gPVA content 3.0-% of the weight melting point Circuit system hot air drying equipment performed heat treatment for the synthetic pulp of the 135 degree-C above for 5 minutes at 125 degrees C like the example 1. The sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making to the high-density-polyethylene synthetic pulp after heat treatment with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet-like object was obtained. Further, circuit system hot air drying equipment performed this sheet, and heat treatment was performed for 5 minutes at 125 degrees C. Then, it was immersed in 90-degree C hot water for 1 minute, circuit system hot air drying equipment performed desiccation for 30 minutes at 50 degrees C again, and the target sheet was obtained. The physical properties of the obtained sheet are shown in Table -1.
[0058] The polyethylene synthetic pulp was obtained like the example 1 except setting to 20g the amount of polyvinyl alcohol added into a <example 3> autoclave. The physical properties are shown below.
Mean fiber length 1.2mm specific surface area 6.2m2 / g freshness 5.0 sec/gPVA content 2.0-% of the weight melting point Circuit system hot air drying equipment performed heat treatment for the 135-degree-C above-mentioned synthetic pulp for 5 minutes at 125 degrees C like the example 1. The sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making to the high-density-polyethylene synthetic pulp after heat treatment with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet-like object was obtained. Further, circuit system hot air drying equipment performed this sheet, and heat treatment was performed for 5 minutes at 125 degrees C. Then, 1 % of the weight was added for the surface active agent (dialkyl sulfo sodium succinate) in the water solution to the sheet, circuit system hot air drying equipment performed desiccation for 30 minutes at 50 degrees C again, and the target sheet was obtained. The physical properties of the obtained sheet are shown in Table -1.
[0059] Without heat-treating the high-density-polyethylene synthetic pulp obtained in the <example 1 of comparison> example 1, immediately, it disaggregated in the JIS mold pulper and paper making was carried out with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour or more, and the sheet was obtained. The physical properties of this sheet are shown in Table -2.
[0060] Without heat-treating the high-density-polyethylene synthetic pulp obtained in the <example 2 of comparison> example 2, immediately, the sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making with the 25x25cm square shape paper machine. The target sheet was obtained like the example 2 below. The physical properties of the obtained sheet are shown in Table -2.
[0061] Without heat-treating the high-density-polyethylene synthetic pulp obtained in the <example 3 of comparison> example 3, immediately, the sheath mixed the bicomponent fiber of low density polyethylene (melting point = 110 degrees C) at 80/20 of a rate with polypropylene, and 1.5 deniers of diameters of fiber and a core part with a fiber length of 5mm disaggregated in the JIS mold pulper, and carried out paper making with the 25x25cm square shape paper machine. The target sheet was obtained like the example 3 below. The physical properties of the obtained sheet are shown in Table -2.
[0062] The polyethylene synthetic pulp was obtained like the example 1 except setting to 4g the amount of polyvinyl

alcohol added into the <example 4 of comparison> autoclave. The physical properties of the obtained synthetic pulp are shown below.
Mean fiber length 1.5mm specific surface area 5.4m2 / g freshness 0.5 sec/gPVA content 0.4-% of the weight melting point Circuit system hot air drying equipment performed the 135-degree-C above-mentioned high-density-polyethylene synthetic pulp by dryness, and heat treatment was performed for 5 minutes at 125 degrees C. The high-density-polyethylene synthetic pulp after heat treatment was disaggregated in the JIS form pulper, and paper making was carried out with the 25x25cm square shape paper machine. Circuit system hot air drying equipment performed the obtained humid sheet, desiccation was performed at 50 degrees C for 1 hour, and the sheet was obtained. The physical properties of the obtained sheet are shown in Table -2.
[0063] The performance test same about the separator of the <example 5 of comparison> polypropylene dry type nonwoven fabric (melt spinning type) was performed. The result is shown in Table -2.
[0064] from the result of Table -1 and 2, it is admitted that an electrolyte holding rate, absorbency, and alkali resistance boil the separator for alkaline cells of an example 1 markedly compared with the separator for alkaline cells used without heat-treating the same synthetic pulp of the example 1 of a comparison, and it excels. Moreover, using the same synthetic pulp, in the example, an example 2, the example 2 of a comparison and an example 3, and the example 3 of a comparison are heat-treated and used, and are used by the example of a comparison, respectively, without heat-treating. Even in this case, it is admitted that the direction of an example is excellent in an electrolyte holding rate, absorbency, and alkali resistance.
[0065]

表－1

	実施例1	実施例2	実施例3
坪量 [g/m²]	60	60	60
厚み [mm]	0．31	0．30	0．31
保液率 [%]	587	433	613
吸液性 [mm]	38．9	46．0	58．3
耐アルカリ性[mm]	44．5	43．2	50．3
シート強度 [kg/15mm]	0．87	0．97	0．88

[0066]

表－２

	比較例１	比較例２	比較例３	比較例４	比較例５
坪量 [g/m²]	６０	６０	６０	６０	３０
厚み [mm]	０．３１	０．３０	０．３１	０．３１	０．１２
保液率 [%]	４５３	２５１	４００	０	３３６
吸液性 [mm]	１４．３	１６．８	３６．０	０	４６．５
耐アルカリ性[mm]	１５．６	１６．３	３１．２	測定せず	０
シート強度 [kg/15mm]	１．１０	１．０２	０．９２	０．０２	０．５４

[Translation done.]